



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

## NOTICE OF ALLOWANCE AND FEE(S) DUE

20551 7590 03/27/2009

THORPE NORTH & WESTERN, LLP.  
P.O. Box 1219  
SANDY, UT 84091-1219

EXAMINER

RAMIREZ, JOHN FERNANDO

ART UNIT

PAPER NUMBER

3737

DATE MAILED: 03/27/2009

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
-----------------	-------------	----------------------	---------------------	------------------

10/615,569

07/07/2003

Steven A. Johnson

01682-22027.CIP3.CON2

9030

TITLE OF INVENTION: APPARATUS AND METHOD FOR IMAGING OBJECTS WITH WAVEFIELDS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	06/29/2009

**THE APPLICATION IDENTIFIED ABOVE HAS BEEN EXAMINED AND IS ALLOWED FOR ISSUANCE AS A PATENT. PROSECUTION ON THE MERITS IS CLOSED. THIS NOTICE OF ALLOWANCE IS NOT A GRANT OF PATENT RIGHTS. THIS APPLICATION IS SUBJECT TO WITHDRAWAL FROM ISSUE AT THE INITIATIVE OF THE OFFICE OR UPON PETITION BY THE APPLICANT. SEE 37 CFR 1.313 AND MPEP 1308.**

**THE ISSUE FEE AND PUBLICATION FEE (IF REQUIRED) MUST BE PAID WITHIN THREE MONTHS FROM THE MAILING DATE OF THIS NOTICE OR THIS APPLICATION SHALL BE REGARDED AS ABANDONED. THIS STATUTORY PERIOD CANNOT BE EXTENDED. SEE 35 U.S.C. 151. THE ISSUE FEE DUE INDICATED ABOVE DOES NOT REFLECT A CREDIT FOR ANY PREVIOUSLY PAID ISSUE FEE IN THIS APPLICATION. IF AN ISSUE FEE HAS PREVIOUSLY BEEN PAID IN THIS APPLICATION (AS SHOWN ABOVE), THE RETURN OF PART B OF THIS FORM WILL BE CONSIDERED A REQUEST TO REAPPLY THE PREVIOUSLY PAID ISSUE FEE TOWARD THE ISSUE FEE NOW DUE.**

### HOW TO REPLY TO THIS NOTICE:

#### I. Review the SMALL ENTITY status shown above.

If the SMALL ENTITY is shown as YES, verify your current SMALL ENTITY status:

A. If the status is the same, pay the TOTAL FEE(S) DUE shown above.

B. If the status above is to be removed, check box 5b on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and twice the amount of the ISSUE FEE shown above, or

If the SMALL ENTITY is shown as NO:

A. Pay TOTAL FEE(S) DUE shown above, or

B. If applicant claimed SMALL ENTITY status before, or is now claiming SMALL ENTITY status, check box 5a on Part B - Fee(s) Transmittal and pay the PUBLICATION FEE (if required) and 1/2 the ISSUE FEE shown above.

II. PART B - FEE(S) TRANSMITTAL, or its equivalent, must be completed and returned to the United States Patent and Trademark Office (USPTO) with your ISSUE FEE and PUBLICATION FEE (if required). If you are charging the fee(s) to your deposit account, section "4b" of Part B - Fee(s) Transmittal should be completed and an extra copy of the form should be submitted. If an equivalent of Part B is filed, a request to reapply a previously paid issue fee must be clearly made, and delays in processing may occur due to the difficulty in recognizing the paper as an equivalent of Part B.

III. All communications regarding this application must give the application number. Please direct all communications prior to issuance to Mail Stop ISSUE FEE unless advised to the contrary.

**IMPORTANT REMINDER: Utility patents issuing on applications filed on or after Dec. 12, 1980 may require payment of maintenance fees. It is patentee's responsibility to ensure timely payment of maintenance fees when due.**

# **PART B - FEE(S) TRANSMITTAL**

**Complete and send this form, together with applicable fee(s), to: Mail Mail Stop ISSUE FEE  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
or Fax (571)-273-2885**

INSTRUCTIONS: This form should be used for transmitting the ISSUE FEE and PUBLICATION FEE (if required). Blocks 1 through 5 should be completed where appropriate. All further correspondence including the Patent, advance orders and notification of maintenance fees will be mailed to the current correspondence address as indicated unless corrected below or directed otherwise in Block 1, by (a) specifying a new correspondence address; and/or (b) indicating a separate "FEE ADDRESS" for maintenance fee notifications.

CURRENT CORRESPONDENCE ADDRESS (Note: Use Block 1 for any change of address)

20551 7590 03/27/2009

**THORPE NORTH & WESTERN, LLP.**  
P.O. Box 1219  
SANDY, UT 84091-1219

Note: A certificate of mailing can only be used for domestic mailings of the Fee(s) Transmittal. This certificate cannot be used for any other accompanying papers. Each additional paper, such as an assignment or formal drawing, must have its own certificate of mailing or transmission.

## **Certificate of Mailing or Transmission**

I hereby certify that this Fee(s) Transmittal is being deposited with the United States Postal Service with sufficient postage for first class mail in an envelope addressed to the Mail Stop ISSUE FEE address above, or being facsimile transmitted to the USPTO (571) 273-2885, on the date indicated below.

(Depositor's name)
(Signature)
(Date)

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,569	07/07/2003	Steven A. Johnson	01682-22027.CIP3.CON2	9030

TITLE OF INVENTION: APPARATUS AND METHOD FOR IMAGING OBJECTS WITH WAVEFIELDS

APPLN. TYPE	SMALL ENTITY	ISSUE FEE DUE	PUBLICATION FEE DUE	PREV. PAID ISSUE FEE	TOTAL FEE(S) DUE	DATE DUE
nonprovisional	YES	\$755	\$300	\$0	\$1055	06/29/2009

EXAMINER	ART UNIT	CLASS-SUBCLASS
RAMIREZ, JOHN FERNANDO	3737	378-901000

1. Change of correspondence address or indication of "Fee Address" (37 CFR 1.363).

- ☐ Change of correspondence address (or Change of Correspondence Address form PTO/SB/122) attached.
- ☐ "Fee Address" indication (or "Fee Address" Indication form PTO/SB/47; Rev 03-02 or more recent) attached. **Use of a Customer Number is required.**

2. For printing on the patent front page, list

- (1) the names of up to 3 registered patent attorneys or agents OR, alternatively, 1 \_\_\_\_\_
- (2) the name of a single firm (having as a member a registered attorney or agent) and the names of up to 2 registered patent attorneys or agents. If no name is listed, no name will be printed. 2 \_\_\_\_\_
- 3 \_\_\_\_\_

3. ASSIGNEE NAME AND RESIDENCE DATA TO BE PRINTED ON THE PATENT (print or type)

PLEASE NOTE: Unless an assignee is identified below, no assignee data will appear on the patent. If an assignee is identified below, the document has been filed for recordation as set forth in 37 CFR 3.11. Completion of this form is NOT a substitute for filing an assignment.

(A) NAME OF ASSIGNEE (B) RESIDENCE: (CITY and STATE OR COUNTRY)

Please check the appropriate assignee category or categories (will not be printed on the patent) : ☐ Individual ☐ Corporation or other private group entity ☐ Government

4a. The following fee(s) are submitted:

- ☐ Issue Fee
- ☐ Publication Fee (No small entity discount permitted)
- ☐ Advance Order - # of Copies \_\_\_\_\_

4b. Payment of Fee(s); (Please first reapply any previously paid issue fee shown above)

- ☐ A check is enclosed.
- ☐ Payment by credit card. Form PTO-2038 is attached.
- ☐ The Director is hereby authorized to charge the required fee(s), any deficiency, or credit any overpayment, to Deposit Account Number \_\_\_\_\_ (enclose an extra copy of this form).

5. Change in Entity Status (from status indicated above)

- ☐ a. Applicant claims SMALL ENTITY status. See 37 CFR 1.27. ☐ b. Applicant is no longer claiming SMALL ENTITY status. See 37 CFR 1.27(g)(2).

NOTE: The Issue Fee and Publication Fee (if required) will not be accepted from anyone other than the applicant; a registered attorney or agent; or the assignee or other party in interest as shown by the records of the United States Patent and Trademark Office.

Authorized Signature \_\_\_\_\_

Date \_\_\_\_\_

Typed or printed name \_\_\_\_\_

Registration No. \_\_\_\_\_

This collection of information is required by 37 CFR 1.311. The information is required to obtain or retain a benefit by the public which is to file (and by the USPTO to process) an application. Confidentiality is governed by 35 U.S.C. 122 and 37 CFR 1.14. This collection is estimated to take 12 minutes to complete, including gathering, preparing, and submitting the completed application form to the USPTO. Time will vary depending upon the individual case. Any comments on the amount of time you require to complete this form and/or suggestions for reducing this burden, should be sent to the Chief Information Officer, U.S. Patent and Trademark Office, U.S. Department of Commerce, P.O. Box 1450, Alexandria, Virginia 22313-1450. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner for Patents, P.O. Box 1450, Alexandria, Virginia 22313-1450.

Under the Paperwork Reduction Act of 1995, no persons are required to respond to a collection of information unless it displays a valid OMB control number.



# UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE  
United States Patent and Trademark Office  
Address: COMMISSIONER FOR PATENTS  
P.O. Box 1450  
Alexandria, Virginia 22313-1450  
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/615,569	07/07/2003	Steven A. Johnson	01682-22027.CIP3.CON2	9030
20551	7590	03/27/2009	EXAMINER	
THORPE NORTH & WESTERN, LLP. P.O. Box 1219 SANDY, UT 84091-1219			RAMIREZ, JOHN FERNANDO	
			ART UNIT	PAPER NUMBER
			3737	
DATE MAILED: 03/27/2009				

## Determination of Patent Term Adjustment under 35 U.S.C. 154 (b) (application filed on or after May 29, 2000)

The Patent Term Adjustment to date is 823 day(s). If the issue fee is paid on the date that is three months after the mailing date of this notice and the patent issues on the Tuesday before the date that is 28 weeks (six and a half months) after the mailing date of this notice, the Patent Term Adjustment will be 823 day(s).

If a Continued Prosecution Application (CPA) was filed in the above-identified application, the filing date that determines Patent Term Adjustment is the filing date of the most recent CPA.

Applicant will be able to obtain more detailed information by accessing the Patent Application Information Retrieval (PAIR) WEB site (<http://pair.uspto.gov>).

Any questions regarding the Patent Term Extension or Adjustment determination should be directed to the Office of Patent Legal Administration at (571)-272-7702. Questions relating to issue and publication fee payments should be directed to the Customer Service Center of the Office of Patent Publication at 1-(888)-786-0101 or (571)-272-4200.

<b>Notice of Allowability</b>	<b>Application No.</b>	<b>Applicant(s)</b>	
	10/615,569	JOHNSON ET AL.	
	<b>Examiner</b>	<b>Art Unit</b>	
	JOHN F. RAMIREZ	3737	

**-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--**

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to 11/18/08.
2. ☒ The allowed claim(s) is/are 1, 3-7, 14-22, 24-27, 30 and 36.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
  - a) ☐ All    b) ☐ Some\*    c) ☐ None    of the:
    1. ☐ Certified copies of the priority documents have been received.
    2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
    3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).
  - \* Certified copies not received: \_\_\_\_\_.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

**THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.**

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS ( as "replacement sheets") must be submitted.
  - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review ( PTO-948) attached
    - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date \_\_\_\_\_.
  - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date \_\_\_\_\_.

**Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).**
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

**Attachment(s)**

- |  |   |
|--|---|
| <ol style="list-style-type: none"> <li>1. <input type="checkbox"/> Notice of References Cited (PTO-892)</li> <li>2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)</li> <li>3. <input checked="" type="checkbox"/> Information Disclosure Statements (PTO/SB/08),<br/>Paper No./Mail Date <u>09/26/08</u></li> <li>4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit of Biological Material</li> </ol> | <ol style="list-style-type: none"> <li>5. <input type="checkbox"/> Notice of Informal Patent Application</li> <li>6. <input type="checkbox"/> Interview Summary (PTO-413),<br/>Paper No./Mail Date _____.</li> <li>7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment</li> <li>8. <input checked="" type="checkbox"/> Examiner's Statement of Reasons for Allowance</li> <li>9. <input type="checkbox"/> Other _____.</li> </ol> |
|--|---|

## DETAILED ACTION

### EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it **MUST** be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. Jason Jones on February 23, 2009 and March 12, 2009.

#### IN THE CLAIMS:

Claims 9-13, 23 and 29 have been canceled.

Claim 1. (currently amended) An imaging apparatus comprising:

- a container for a liquid;

- a transmitter for transmitting wavefield energy into the liquid and a tissue appendage of a body of a mammal;

- a device holding the tissue appendage stationary relative to the liquid in the container;

- a receiver to receive wavefield energy transmitted through the liquid and the tissue appendage; and

- an image renderer to process the received wavefield energy in an inverse scattering parabolic propagation step to render therefrom an image of the tissue appendage; wherein

- the wavefield energy that is received by the receiver is transmitted from the transmitter and has a wavelength in the liquid in the container corresponding to a corresponding maximum temporal frequency; and

Art Unit: 3737

the image renderer performs an inverse scattering parabolic propagation step that is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength of the corresponding maximum temporal frequency.

Claim 14. (currently amended) The imaging apparatus as defined in claim 1, wherein:

the image of the tissue appendage has a plurality of image components;  
the wavefield energy that is received by the receiver is transmitted from the transmitter:

has a wavelength in the liquid in the container corresponding to a corresponding maximum temporal frequency; and

is discretized by a plurality of points each being separated from other said points by an average spatial separation;

the image renderer ~~performs imaging method which~~ totally or partially uses wave equation modeling in image rendering, wherein:

the wave equation modeling utilizes a nonlinear operator relating an inversion data to the plurality of image components;

the inversion data is a transformation of the received wavefield energy and is within the range of the nonlinear operator;

the domain of the nonlinear operator is the image components;

the image renderer ~~imaging method~~ uses an arithmetic operation which computes the received wavefield energy on a set of surfaces given the wavefield energy on another, disjoint set of surfaces using a parabolic differential equation in the derivation of the arithmetic operation; and

the image renderer ~~imaging method~~ is accelerated in speed by employing the average spatial separation of the points to be greater than one half the wavelength in the liquid.

Art Unit: 3737

Claim 18. (currently amended) A breast imaging apparatus comprising:

a water tank;

means for immobilizing a breast surface relative to water in the water tank,

wherein the breast surface is contiguous with the body of a mammal;

means for irradiating the breast surface with wavefield energy;

means for receiving the wavefield energy; and

means for processing the received wavefield energy to render an image of tissue beneath the breast surface by performing an inverse scattering parabolic propagation step; wherein:

the wavefield energy that is received by the receiver is transmitted from the transmitter and has both a wavelength in the water and a corresponding wavefield frequency component;

the means for processing the received wavefield energy to render an image of tissue beneath the breast surface performs an inverse scattering parabolic propagation step that is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength in the water of the corresponding wavefield frequency component.

27. (currently amended) A method of imaging a mammalian breast appendage, the method comprising:

immobilizing a mammalian breast appendage in a liquid bath relative to the liquid bath;

irradiating the liquid bath and the mammalian breast appendage with wavefield energy;

receiving at a receiver a received wavefield energy that is transmitted through both the liquid bath and the mammalian breast appendage; and

using the received wavefield energy to render an image of the mammalian breast using an inverse scattering parabolic propagation step; wherein:

Art Unit: 3737

the received wavefield energy has a wavelength in the liquid bath and a corresponding wavefield frequency component; and

the inverse scattering parabolic propagation step is accelerated in speed by employing a computational pixel size that is greater than one half of the wavelength in the liquid bath of the corresponding wavefield frequency component.

36. (currently amended) An imaging apparatus comprising:

a container for a liquid;

a transmitter for transmitting wavefield energy into the liquid and a tissue appendage of a body of a mammal;

a device holding the tissue appendage stationary relative to the liquid in the container;

a receiver to receive wavefield energy transmitted through both the liquid and the tissue appendage;

an image renderer to process the received wavefield energy to render therefrom an image of the tissue appendage; and wherein:

the image of the tissue appendage has a plurality of image components;

the wavefield energy that is received by the receiver is transmitted from the transmitter:

has a wavelength in the liquid in the container corresponding to a corresponding maximum temporal frequency; and

is discretized by a plurality of points each being separated from other said points by an average spatial separation;

the image renderer ~~performs imaging method which totally or~~ partially uses wave equation modeling in image rendering, wherein:



the wave equation modeling utilizes a nonlinear operator relating an inversion data to the plurality of image components;  
the inversion data is a transformation of the received wavefield energy and is within the range of the nonlinear operator;  
the domain of the nonlinear operator is the image components;  
the image renderer ~~imaging method~~ uses an arithmetic operation which computes the received wavefield energy on a set of surfaces given the wavefield energy on another, disjoint set of surfaces using a parabolic differential equation in the derivation of the arithmetic operation; and  
the image renderer ~~imaging method~~ is accelerated in speed by employing the average spatial separation of the points to be greater than one half the wavelength in the liquid.

***Allowable Subject Matter***

The following is an examiner's statement of reasons for allowance:

The prior art of record of Spivey et al. (US5305757), Clement et al. (US4328707) or Brenden (US3765403) are directed to through- transmission water bath breast imagers albeit they do not teach immobilizing the breast, however it would have been obvious in view of the latter which is per se directed to holographic transmission to immobilize the breast via plates in order to hold the tissue appendage stationary for the duration of a measurement.

None of the prior art, alone or in combination teaches or suggests an imaging apparatus with an image renderer to process the received wavefield energy in an

Art Unit: 3737

inverse scattering parabolic propagation step to render therefrom an image of the tissue appendage as describe in claim 1.

Any comments considered necessary by applicant must be submitted no later than the payment of the issue fee and, to avoid processing delays, should preferably accompany the issue fee. Such submissions should be clearly labeled "Comments on Statement of Reasons for Allowance."

Any inquiry concerning this communication or earlier communications from the examiner should be directed to JOHN F. RAMIREZ whose telephone number is (571)272-8685. The examiner can normally be reached on (Mon-Fri) 7:00 - 3:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Brian L. Casler can be reached on (571) 272-4956. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/BRIAN CASLER/

Application/Control Number: 10/615,569

Page 8

Art Unit: 3737

Supervisory Patent Examiner, Art  
Unit 3737

/J. F. R./  
Examiner, Art Unit 3737